CLAIMS

1. A device for fusion splicing ends of two optical fibers to each other comprising:
- retainers for optical fibers adapted to hold ends of two optical fibers with end surfaces placed at each other in a splice position,
- a CO_2 laser emitting light to the splice position,

characterized by a mirror having a curved concave surface located to deflect a collimated direct light beam emitted by the CO_2 laser towards the splice position and to make it converge to a focus in the direction of the splice position, the splice position located at a distance of the collimated direct light beam.

2. A device according to claim 1, **characterized in** that the concave mirror and the retainers are adapted to make the splice position be located a relatively small distance of a focus of the collimated direct light beam as reflected by the concave mirror.

3. A device according to claim 1, **characterized by** the surface of the concave mirror having a nearly paraboloid shape, in particular the concave mirror being the off-axis paraboloid type.

4. A device according to claim 1, **characterized in** that the emission wavelength of the CO_2 laser is substantially 9.3 μm.

5. A device according to claim 1, **characterized in** that the diameter of the collimated direct laser beam emitted by the CO_2 laser is in the range of 2 to 4 mm, preferably substantially 3 mm.

6. A device according to claim 1, **characterized in** that the maximum power of the CO_2 laser is in the range of 0.8 to 1 W.

7. A device according to claim 1, **characterized in** that the angle θ with which the collimated direct light beam of the CO_2 laser is deflected by the concave mirror is in the range of 45 to 70°, in particular substantially 60°.

8. A device according to claim 1, **characterized in** that the collimated direct light beam emitted by the CO_2 laser is focused by the concave mirror to a point located 30 to 50 mm in front of the concave mirror.

9. A device according to claim 1, **characterized in** that the distance between the center of the light spot at the splice position and a center axis of the collimated direct light beam emitted by the CO_2 laser is in the range of 30 - 40 mm, in particular substantially 40 mm.

10. A device according to claim 1, **characterized in** that the diameter of the light spot, produced by light emitted by the CO_2 laser and deflected by the concave mirror, at the splice position is in the range of 300 to 500 μm.

11. A device according to claim 1, **characterized by** a beam damping device located to receive and absorb the light that is deflected by the concave mirror and has passed the splice position.

12. A device according to claim 1, **characterized by** a pointing light source issuing light formed and directed to form a light beam located and formed substantially as the collimated direct light beam emitted by the CO_2 laser, i.e. being coaxial therewith and having substantially the same cross-section.

13. A device according to claim 12, **characterized in** that the pointing light source comprises a laser diode emitting light in the visible range.

14. A device according to claim 13, **characterized in** that the operating power of the laser diode is in the range of 5 to 10 mW.

15. A device according to claim 12, **characterized by** a semi-transparent or semi-reflecting mirror that is placed so that the collimated direct light beam emitted by the CO_2 laser passes the mirror and that directs light from the pointing light source to become coaxial with the collimated direct light beam.

16. A method of fusion splicing ends of two optical fibers to each other, **characterized by** the successive steps of:

- aligning the ends to have end surfaces near or in close contact with each other at a splice position,
- forming and directing a collimated direct light beam emitted by a CO_2 laser to form a suitable spot at the splice position, the forming and directing being made by observing light emitted by a pointing light source, said light having substantially the same beam location and geometry as the collimated direct light beam emitted by the CO_2 laser,
- illuminating the splice position by the formed and directed collimated direct light beam emitted by the CO_2 laser.

17. A method according to claim 16, **characterized in** that in the step of forming and directing the collimated direct light beam emitted by the CO_2 laser, the collimated direct light beam is formed and deflected by being reflected by a mirror having a concave surface of nearly paraboloid shape, in particular the concave mirror being the off-axis paraboloid type.

18. A method according to claim 16, **characterized in** that in the step of forming and directing the collimated direct light beam emitted by the CO_2 laser, the collimated direct light beam is formed and directed to have a focus located at a relatively small distance of the splice position.

19. A method according to claim 16, **characterized in** that in the step of forming and

directing the collimated direct light beam emitted by the CO_2 laser, the collimated direct light beam is formed and directed to have the spot at the splice position located at a distance of the collimated direct light beam.

20. A method according to claim 17, **characterized in** that in the step of forming and directing the collimated direct light beam emitted by the CO_2 laser, the collimated direct light beam is formed and directed by being reflected by a concave mirror having a nearly paraboloid shape.